We claim:

1. A process for preparing lactones by catalytic carbonylation of oxiranes using a catalyst system comprising

a) at least one carbonylation catalyst A comprising uncharged or anionic transition metal complexes of metals of groups 5 to 11 of the Periodic Table of the Elements,

b) at least one metal compound B of the formula (I)

$$MX_xR_{n-x} \qquad (I)$$

where

M is an element of group 2, 3, 4, 12, 13,
R is hydrogen or a hydrocarbon radical which may be substituted on the carbon atoms other than on the carbon atom bound to M,
X is an anion,
n is a number corresponding to the valence of M,
x is in the range from 0 to n, and

c) at least one organic, chiral compound C which has fewer than four coordination sites.

2. A process as claimed in claim 1, wherein enantiomerically enriched lactones are obtained in the process.

3. A process as claimed in claim 1 or 2, wherein the component A is selected so that a cobalt carbonyl compound is present under the reaction conditions.

4. A process as claimed in any of claims 1 to 3, wherein M in the formula (I) is Al, Mg, Zn, Ti, Zr or Sn.

5. A process as claimed in any of claims 1 to 4, wherein, in the formula (I), R is hydrogen or C_{1-32}-alkyl, C_{2-20}-alkenyl, C_{3-20}-cycloalkyl, C_{6-18}-aryl, C_{7-20}-aralkyl or C_{7-20}-alkaryl, where substituents may be present on the carbon atoms other than the carbon atom bound to M,

and/or X is Cl, Br, I, sulfonate, oxide, C_{1-32}-alkoxide or amide.

6. A process as claimed in any of claims 1 to 5, wherein the component B is $AlCl_xR_{3-x}$, where x is from 0 to 3 and R is C_{1-6}-alkyl.

7. A process as claimed in any of claims 1 to 6, wherein the component C is a bisoxazoline compound and/or comprises at least one chiral alcohol.

8. A process for preparing a catalyst system by mixing the components A, B and C as set forth in any of claims 1 to 7 in any order.

9. A catalyst system comprising the components A, B, C as defined in any of claims 1 to 8.

10. The use of a catalyst system as claimed in claim 9 in carbonylation reactions.